

1. Find the domain  $f(x) = \frac{x^2 - 9}{x - 3}$  .

2. Find the domain  $g(x) = \frac{1}{x^2 + 8x + 12}$  .

3. Find the domain  $g(x) = \sqrt{49 - x^2}$  .

4. Find the domain  $f(x) = \sqrt{3 + 5x}$  .

5. Find an equation of the line through the pair of points  $(1, -2)$  and  $(-2, -5)$  in slope-intercept form (No decimals).

6. Find the slope and the  $y$ -intercept of the following line  $\frac{3x - 2}{4} = \frac{4y + 1}{2}$  .

7. Let  $f(x) = \begin{cases} 3x - 1, & \text{if } x < -1 \\ x + 1, & \text{if } x \geq -1 \end{cases}$

(a) Find  $f(-1)$ .

(b) Find  $\lim_{x \rightarrow -1^-} f(x)$ .

(c) Find  $\lim_{x \rightarrow -1^+} f(x)$ .

(d) Find  $\lim_{x \rightarrow -1} f(x)$ .

(e) Is  $f(x)$  continuous at  $x = -1$ ? Explain clearly.

8. Find the exact limit (No decimals).  $\lim_{x \rightarrow -9} \left( \frac{x^2 - 81}{x + 9} \right)$

9. Find the exact limit (No decimals).  $\lim_{x \rightarrow -4} \left( \frac{x + 2}{x^2 - x - 12} \right)$

10. Find the exact limit (No decimals).  $\lim_{x \rightarrow -5} \left( 4 - \sqrt{x^2 + 4x + 4} \right)$

11. Given  $f(x) = x^2 - 4x$ , find  $f'(3)$  by using the limit definition of the derivative by completing the following three steps:

(a) Simplify the difference quotient  $\frac{f(x+h) - f(x)}{h}$ .

- (b) Determine the derivative by taking the limit of the simplified difference quotient

$$f'(x) = \lim_{h \rightarrow 0} \frac{f(x+h) - f(x)}{h} . \text{ Use your result in part a).}$$

(c) Find  $f'(3)$ .

12. A college student decides to mow lawns in the summer. The initial cost of the lawn mower is \$300. Gasoline and maintenance costs are \$1.50 per lawn. The student charges \$15 to mow a lawn.

**Simplify all functions.**

(a) Formulate a function  $C(x)$  for the total cost of mowing  $x$  lawns.

(b) Formulate a function  $R(x)$  for the total revenue of mowing  $x$  lawns.

(c) Formulate a function  $P(x)$  for the total profit of mowing  $x$  lawns.

(d) How many lawns must the college student mow in order to break even ?